

AMENDMENTS TO THE DRAWINGS

Please replace sheet 7, which includes figures 7 and 8, with the attached replacement sheet. The replacement sheet adds reference numerals 700 and 800 to figures 7 and 8.

REMARKS

The Office action mailed November 2, 2006, rejected the claims and objected to the specification. This reply amends claims 1, 3, 7, 14, 15, 20, 23, 28, 32, and 35, the drawings, and the specification. The applicant respectfully requests reconsideration in light of the amendments and remarks presented in this reply.

I. Response to objection

The specification stands objected to by the action. This reply amends the specification and drawings to address the issues raised in the action.

II. Response to § 112 rejection of claims 15 and 28

Claims 15 and 28 stand rejected under 35 U.S.C. § 112, second paragraph. This reply amends claims 15 and 28 to address the issues raised in the action.

III. Response to rejection of independent claim 1

Independent claim 1 stands rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 6,232,626 ("Rhodes"). This rejection is respectfully traversed.

Claim 1 describes a photodiode comprising, *inter alia*, "at least two of a first layer having a first band gap and at least two of a second layer having a second band gap, wherein the first layers are alternated with the second layers." Claim 1 is patentable at least because Rhodes does not teach or suggest such a photodiode.

Rhodes discloses methods applicable to CMOS imaging devices in which an image is captured by an array of pixels having associated photodiodes and pixel cell circuitry for charge accumulation and amplification (see col. 10, ll. 20-24). Figure 5 illustrates such an imaging apparatus. Although Rhodes teaches a photosensor having numerous layers, nowhere does Rhodes teach or suggest the above-cited limitation of claim 1. As Rhodes does not teach or suggest every limitation of claim 1, Rhodes does not render claim 1 unpatentable.

IV. Response to rejection of independent claim 20

Independent claim 20 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Rhodes in view of U.S. Patent No. 6,127,692 ("Sugawa"). This rejection is respectfully traversed.

Claim 20 describes a photodiode comprising, *inter alia*, "at least two of a first layer comprising a first material and at least two of a second layer comprising a second material, wherein the layers are configured such that a difference between the conduction band energies of the first and second materials and a difference between the valence band energies of the first and second materials promotes ionization by a first carrier type and suppresses ionization by a second carrier type and wherein the first layers are alternated with the second layers." Claim 20 is patentable at least because Rhodes in view of Sugawa does not teach or suggest such a photodiode.

As explained above, Rhodes does not disclose any feature comparable to the above-cited feature of claim 20. Moreover, Rhodes in view of Sugawa does not teach or suggest this feature as well.

Regarding Sugawa, the action cites lines 14-17 of column 3, which relate to the photodiode structure shown in figures 2A and 2B. Specifically, lines 14-17 relate to layers 201, 203, 205, 207, and 209 of the photodiode. Each of these layers has a different band gap, as explained in lines 12 and 13 ("[t]hese layers have compositions for linearly changing a band gap from a narrow band-gap E_{g2} to a wide band-gap E_{g3} "). Thus, Sugawa teaches a structure where each layer has a different band gap. In contrast, claim 20 describes a photodiode comprising, *inter alia*, "at least two of a first layer comprising a first material and at least two of a second layer comprising a second material" wherein "the first layers are alternated with the second layers."

As no other portions of Sugawa have been cited or found that relate to the above-cited limitation of claim 20, Sugawa does not teach the limitation missing from Rhodes. As a result, no combination of Rhodes and Sugawa renders claim 20 unpatentable.

V. Response to rejection of independent claim 32

Claim 32 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Rhodes in view of U.S. Patent No. 5,818,322 ("Tasumi"). This rejection is respectfully traversed.

Claim 32 describes a photodiode comprising, *inter alia*, "at least two layers of Si alternating with at least two layers of $\text{Si}_x\text{Ge}_{1-x}$." This claim is patentable at least because Rhodes in view of Tasumi does not teach or suggest this limitation.

As explained above, Rhodes does not teach or suggest this limitation. Furthermore, Rhodes in view of Tasumi does not teach or suggest the above-cited limitation of claim 32 as well.

Tasumi relates to a photosensitive element for optical communications. According to Tasumi, a photosensing portion 2 is buried and an optical fiber is fixed at the same height as the photosensing portion to introduce light in parallel along the surface. Tasumi teaches that this allows the step on the substrate surface to be eliminated thereby allowing an optical driver 3 to be formed on the same chip as the photosensing portion 2 (col. 4, ll. 1-10). Significantly, Tasumi does not teach an imager having an array of photodiodes for capturing an image.

As the teachings of Tasumi relating to sending and receiving optical signals on the same chip bear no relation to sensing an image using an array of pixels, there is no reason to believe that at the time of the invention one of ordinary skill would have been motivated to replace the imager array photodiode of Rhodes with the optical communications photosensitive element of Tasumi. Therefore, no combination of Rhodes and Tasumi teaches or suggests all the limitations of claim 32.

VI. Response to rejection of independent claim 35

Claim 35 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Rhodes in view of Sugawa and further in view of Tasumi. This rejection is respectfully traversed.

Claim 35 defines a photodiode comprising, *inter alia*, "at least two layers of a first material alternating with at least two layers of a second material," "wherein the layers are configured to promote ionization by a first carrier type and suppress ionization by a second carrier type." This claim is patentable at least because no combination of Rhodes, Sugawa, or Tasumi teaches or suggests at least the above-cited feature of claim 35.

The above-cited limitation of claim 35 is comparable to the limitation of claims 1, 20, and 32 discussed above. As such, claim 35 is patentable over any combination of Rhodes, Sugawa, or Tasumi for at least the reasons discussed above.

VII. Response to rejection of dependent claims

Dependent claims 11 and 15-19 stand rejected under 35 U.S.C. § 102(b) as anticipated by Rhodes. Additionally, dependent claims 2, 3, 5-10, 12, 13, 33, and 34 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Rhodes in view Tasumi, dependent claim 14 stands rejected under 35 U.S.C. § 103(a) as unpatentable over Rhodes in view of U.S. Patent

Application Publication No. 2004/0079408 ("Fetzer"), dependent claims 4 and 28-31 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Rhodes in view of Sugawa, and dependent claims 21-27, 36, and 37 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Rhodes in view Sugawa and further in view of Tasumi.

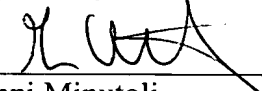
These rejections are respectfully traversed. Each of these claims is allowable at least because it depends from a patentable base claim

VIII. Conclusion

In view of the amendments and remarks presented in this reply, the applicant believes the pending application is in condition for allowance. If there are any formal matters remaining after this reply, the applicant respectfully requests the examiner to telephone the undersigned. If there are any additional fees associated with the filing of this reply, including fees required under 35 C.F.R. §§ 1.16 or 1.17, please charge them to deposit account no. 04-1073.

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Respectfully submitted,

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